# Create User Defined Routes (UDR) using a template

This article covers the Resource Manager deployment model. You can also [create UDRs in the classic deployment mode](/documentation/articles/virtual-networks-udr-how-to).

## UDR resources in a template file

You can view and download the [sample template](https://github.com/telmosampaio/azure-templates/tree/master/IaaS-NSG-UDR).

The section below shows the definition of the front end UDR in the azuredeploy-vnet-nsg-udr.json file, based on the scenario above.

"apiVersion": "2015-06-15",  
"type": "Microsoft.Network/routeTables",  
"name": "[parameters('frontEndRouteTableName')]",  
"location": "[resourceGroup().location]",  
"tags": {  
 "displayName": "UDR - FrontEnd"  
},  
"properties": {  
 "routes": [  
 {  
 "name": "RouteToBackEnd",  
 "properties": {  
 "addressPrefix": "[parameters('backEndSubnetPrefix')]",  
 "nextHopType": "VirtualAppliance",  
 "nextHopIpAddress": "[parameters('vmaIpAddress')]"  
 }  
 }  
 ]

To associate the UDR to the front end subnet, you have to change the subnet definition in the template, and use the reference id for the UDR.

"subnets": [  
 "name": "[parameters('frontEndSubnetName')]",  
 "properties": {  
 "addressPrefix": "[parameters('frontEndSubnetPrefix')]",  
 "networkSecurityGroup": {  
 "id": "[resourceId('Microsoft.Network/networkSecurityGroups', parameters('frontEndNSGName'))]"  
 },  
 "routeTable": {  
 "id": "[resourceId('Microsoft.Network/routeTables', parameters('frontEndRouteTableName'))]"  
 }  
 },  
 ...]

Notice the same being done for the back end NSG and the back end subnet in the template.

You also need to ensure that the **FW1** VM has the IP forwarding property enabled on the NIC that will be used to receive and forward packets. The section below shows the definition of the NIC for FW1 in the azuredeploy-nsg-udr.json file, based on the scenario above.

"apiVersion": "2015-06-15",  
"type": "Microsoft.Network/networkInterfaces",  
"location": "[variables('location')]",  
"tags": {  
 "displayName": "NetworkInterfaces - DMZ"  
},  
"name": "[concat(variables('fwVMSettings').nicName, copyindex(1))]",  
"dependsOn": [  
 "[concat('Microsoft.Network/publicIPAddresses/', variables('fwVMSettings').pipName, copyindex(1))]",  
 "[concat('Microsoft.Resources/deployments/', 'vnetTemplate')]"  
],  
"properties": {  
 "ipConfigurations": [  
 {  
 "name": "ipconfig1",  
 "properties": {  
 "enableIPForwarding": true,  
 "privateIPAllocationMethod": "Static",  
 "privateIPAddress": "[concat('192.168.0.',copyindex(4))]",  
 "publicIPAddress": {  
 "id": "[resourceId('Microsoft.Network/publicIPAddresses',concat(variables('fwVMSettings').pipName, copyindex(1)))]"  
 },  
 "subnet": {  
 "id": "[variables('dmzSubnetRef')]"  
 }  
 }  
 }  
 ]  
},  
"copy": {  
 "name": "fwniccount",  
 "count": "[parameters('fwCount')]"  
}

## Deploy the ARM template by using click to deploy

The sample template available in the public repository uses a parameter file containing the default values used to generate the scenario described above. To deploy this template using click to deploy, follow [this link](https://github.com/telmosampaio/azure-templates/tree/master/IaaS-NSG-UDR), click **Deploy to Azure**, replace the default parameter values if necessary, and follow the instructions in the portal.

## Deploy the ARM template by using PowerShell

To deploy the ARM template you downloaded by using PowerShell, follow the steps below.

1. If you have never used Azure PowerShell, see [How to Install and Configure Azure PowerShell](/documentation/articles/powershell-install-configure) and follow the instructions all the way to the end to sign into Azure and select your subscription.
2. Run the **New-AzureRMResourceGroup** cmdlet to create a resource group using the template.

* New-AzureRMResourceGroup -Name TestRG -Location westus `  
   -TemplateFile 'https://raw.githubusercontent.com/telmosampaio/azure-templates/master/IaaS-NSG-UDR/azuredeploy.json' `  
   -TemplateParameterFile 'https://raw.githubusercontent.com/telmosampaio/azure-templates/master/IaaS-NSG-UDR/azuredeploy.parameters.json'
* Expected output:
* ResourceGroupName : TestRG  
  Location : westus  
  ProvisioningState : Succeeded  
  Tags :   
  Permissions :   
   Actions NotActions  
   ======= ==========  
   \*   
    
  Resources :   
   Name Type Location  
   ================== ======================================= ========  
   ASFW Microsoft.Compute/availabilitySets westus   
   ASSQL Microsoft.Compute/availabilitySets westus   
   ASWEB Microsoft.Compute/availabilitySets westus   
   FW1 Microsoft.Compute/virtualMachines westus   
   SQL1 Microsoft.Compute/virtualMachines westus   
   SQL2 Microsoft.Compute/virtualMachines westus   
   WEB1 Microsoft.Compute/virtualMachines westus   
   WEB2 Microsoft.Compute/virtualMachines westus   
   NICFW1 Microsoft.Network/networkInterfaces westus   
   NICSQL1 Microsoft.Network/networkInterfaces westus   
   NICSQL2 Microsoft.Network/networkInterfaces westus   
   NICWEB1 Microsoft.Network/networkInterfaces westus   
   NICWEB2 Microsoft.Network/networkInterfaces westus   
   NSG-BackEnd Microsoft.Network/networkSecurityGroups westus   
   NSG-FrontEnd Microsoft.Network/networkSecurityGroups westus   
   PIPFW1 Microsoft.Network/publicIPAddresses westus   
   PIPSQL1 Microsoft.Network/publicIPAddresses westus   
   PIPSQL2 Microsoft.Network/publicIPAddresses westus   
   PIPWEB1 Microsoft.Network/publicIPAddresses westus   
   PIPWEB2 Microsoft.Network/publicIPAddresses westus   
   UDR-BackEnd Microsoft.Network/routeTables westus   
   UDR-FrontEnd Microsoft.Network/routeTables westus   
   TestVNet Microsoft.Network/virtualNetworks westus   
   testvnetstorageprm Microsoft.Storage/storageAccounts westus   
   testvnetstoragestd Microsoft.Storage/storageAccounts westus   
    
  ResourceId : /subscriptions/628dad04-b5d1-4f10-b3a4-dc61d88cf97c/resourceGroups/TestRG

## Deploy the ARM template by using the Azure CLI

To deploy the ARM template by using the Azure CLI, follow the steps below.

1. If you have never used Azure CLI, see [Install and Configure the Azure CLI](/documentation/articles/xplat-cli) and follow the instructions up to the point where you select your Azure account and subscription.
2. Run the **azure config mode** command to switch to Resource Manager mode, as shown below.

* azure config mode arm
* Here is the expected output for the command above:
* info: New mode is arm

1. From your browser, navigate to **https://raw.githubusercontent.com/telmosampaio/azure-templates/master/IaaS-NSG-UDR/azuredeploy.parameters.json**, copy the contents of the json file and paste into a new file in your computer. For this scenario, you would be copying the values below to a file named **c:.parameters.json**.

* {  
   "$schema": "https://schema.management.azure.com/schemas/2015-01-01/deploymentParameters.json#",  
   "contentVersion": "1.0.0.0",  
   "parameters": {  
   "fwCount": {  
   "value": 1  
   },  
   "webCount": {  
   "value": 2  
   },  
   "sqlCount": {  
   "value": 2  
   }  
   }  
  }

1. Run the **azure group create** cmdlet to deploy the new VNet by using the template and parameter files you downloaded and modified above. The list shown after the output explains the parameters used.

* azure group create -n TestRG -l westus --template-uri 'https://raw.githubusercontent.com/telmosampaio/azure-templates/master/IaaS-NSG-UDR/azuredeploy.json' -e 'c:\udr\azuredeploy.parameters.json'
* Expected output:
* info: Executing command group create  
  info: Getting resource group TestRG  
  info: Updating resource group TestRG  
  info: Updated resource group TestRG  
  info: Initializing template configurations and parameters  
  info: Creating a deployment  
  info: Created template deployment "azuredeploy"  
  data: Id: /subscriptions/xxxxxxxx-xxxx-xxxx-xxxx-xxxxxxxxxxxx/resourceGroups/TestRG  
  data: Name: TestRG  
  data: Location: westus  
  data: Provisioning State: Succeeded  
  data: Tags: null  
  data:   
  info: group create command OK

1. Run the **azure group show** command to view the resources created in the new resource group.

* azure group show TestRG
* Expected result
* info: Executing command group show  
  info: Listing resource groups  
  info: Listing resources for the group  
  data: Id: /subscriptions/xxxxxxxx-xxxx-xxxx-xxxx-xxxxxxxxxxxx/resourceGroups/TestRG  
  data: Name: TestRG  
  data: Location: westus  
  data: Provisioning State: Succeeded  
  data: Tags: null  
  data: Resources:  
  data:   
  data: Id : /subscriptions/xxxxxxxx-xxxx-xxxx-xxxx-xxxxxxxxxxxx/resourceGroups/TestRG/providers/Microsoft.Compute/availabilitySets/ASFW  
  data: Name : ASFW  
  data: Type : availabilitySets  
  data: Location: westus  
  data: Tags : displayName=AvailabilitySet - DMZ  
  data:   
  data: Id : /subscriptions/xxxxxxxx-xxxx-xxxx-xxxx-xxxxxxxxxxxx/resourceGroups/TestRG/providers/Microsoft.Compute/availabilitySets/ASSQL  
  data: Name : ASSQL  
  data: Type : availabilitySets  
  data: Location: westus  
  data: Tags : displayName=AvailabilitySet - SQL  
  data:   
  data: Id : /subscriptions/xxxxxxxx-xxxx-xxxx-xxxx-xxxxxxxxxxxx/resourceGroups/TestRG/providers/Microsoft.Compute/availabilitySets/ASWEB  
  data: Name : ASWEB  
  data: Type : availabilitySets  
  data: Location: westus  
  data: Tags : displayName=AvailabilitySet - Web  
  data:   
  data: Id : /subscriptions/xxxxxxxx-xxxx-xxxx-xxxx-xxxxxxxxxxxx/resourceGroups/TestRG/providers/Microsoft.Compute/virtualMachines/FW1  
  data: Name : FW1  
  data: Type : virtualMachines  
  data: Location: westus  
  data: Tags : displayName=VMs - DMZ  
  data:   
  data: Id : /subscriptions/xxxxxxxx-xxxx-xxxx-xxxx-xxxxxxxxxxxx/resourceGroups/TestRG/providers/Microsoft.Compute/virtualMachines/SQL1  
  data: Name : SQL1  
  data: Type : virtualMachines  
  data: Location: westus  
  data: Tags : displayName=VMs - SQL  
  data:   
  data: Id : /subscriptions/xxxxxxxx-xxxx-xxxx-xxxx-xxxxxxxxxxxx/resourceGroups/TestRG/providers/Microsoft.Compute/virtualMachines/SQL2  
  data: Name : SQL2  
  data: Type : virtualMachines  
  data: Location: westus  
  data: Tags : displayName=VMs - SQL  
  data:   
  data: Id : /subscriptions/xxxxxxxx-xxxx-xxxx-xxxx-xxxxxxxxxxxx/resourceGroups/TestRG/providers/Microsoft.Compute/virtualMachines/WEB1  
  data: Name : WEB1  
  data: Type : virtualMachines  
  data: Location: westus  
  data: Tags : displayName=VMs - Web  
  data:   
  data: Id : /subscriptions/xxxxxxxx-xxxx-xxxx-xxxx-xxxxxxxxxxxx/resourceGroups/TestRG/providers/Microsoft.Compute/virtualMachines/WEB2  
  data: Name : WEB2  
  data: Type : virtualMachines  
  data: Location: westus  
  data: Tags : displayName=VMs - Web  
  data:   
  data: Id : /subscriptions/xxxxxxxx-xxxx-xxxx-xxxx-xxxxxxxxxxxx/resourceGroups/TestRG/providers/Microsoft.Network/networkInterfaces/NICFW1  
  data: Name : NICFW1  
  data: Type : networkInterfaces  
  data: Location: westus  
  data: Tags : displayName=NetworkInterfaces - DMZ  
  data:   
  data: Id : /subscriptions/xxxxxxxx-xxxx-xxxx-xxxx-xxxxxxxxxxxx/resourceGroups/TestRG/providers/Microsoft.Network/networkInterfaces/NICSQL1  
  data: Name : NICSQL1  
  data: Type : networkInterfaces  
  data: Location: westus  
  data: Tags : displayName=NetworkInterfaces - SQL  
  data:   
  data: Id : /subscriptions/xxxxxxxx-xxxx-xxxx-xxxx-xxxxxxxxxxxx/resourceGroups/TestRG/providers/Microsoft.Network/networkInterfaces/NICSQL2  
  data: Name : NICSQL2  
  data: Type : networkInterfaces  
  data: Location: westus  
  data: Tags : displayName=NetworkInterfaces - SQL  
  data:   
  data: Id : /subscriptions/xxxxxxxx-xxxx-xxxx-xxxx-xxxxxxxxxxxx/resourceGroups/TestRG/providers/Microsoft.Network/networkInterfaces/NICWEB1  
  data: Name : NICWEB1  
  data: Type : networkInterfaces  
  data: Location: westus  
  data: Tags : displayName=NetworkInterfaces - Web  
  data:   
  data: Id : /subscriptions/xxxxxxxx-xxxx-xxxx-xxxx-xxxxxxxxxxxx/resourceGroups/TestRG/providers/Microsoft.Network/networkInterfaces/NICWEB2  
  data: Name : NICWEB2  
  data: Type : networkInterfaces  
  data: Location: westus  
  data: Tags : displayName=NetworkInterfaces - Web  
  data:   
  data: Id : /subscriptions/xxxxxxxx-xxxx-xxxx-xxxx-xxxxxxxxxxxx/resourceGroups/TestRG/providers/Microsoft.Network/networkSecurityGroups/NSG-BackEnd  
  data: Name : NSG-BackEnd  
  data: Type : networkSecurityGroups  
  data: Location: westus  
  data: Tags : displayName=NSG - Front End  
  data:   
  data: Id : /subscriptions/xxxxxxxx-xxxx-xxxx-xxxx-xxxxxxxxxxxx/resourceGroups/TestRG/providers/Microsoft.Network/networkSecurityGroups/NSG-FrontEnd  
  data: Name : NSG-FrontEnd  
  data: Type : networkSecurityGroups  
  data: Location: westus  
  data: Tags : displayName=NSG - Remote Access  
  data:   
  data: Id : /subscriptions/xxxxxxxx-xxxx-xxxx-xxxx-xxxxxxxxxxxx/resourceGroups/TestRG/providers/Microsoft.Network/publicIPAddresses/PIPFW1  
  data: Name : PIPFW1  
  data: Type : publicIPAddresses  
  data: Location: westus  
  data: Tags : displayName=PublicIPAddresses - DMZ  
  data:   
  data: Id : /subscriptions/xxxxxxxx-xxxx-xxxx-xxxx-xxxxxxxxxxxx/resourceGroups/TestRG/providers/Microsoft.Network/publicIPAddresses/PIPSQL1  
  data: Name : PIPSQL1  
  data: Type : publicIPAddresses  
  data: Location: westus  
  data: Tags : displayName=PublicIPAddresses - SQL  
  data:   
  data: Id : /subscriptions/xxxxxxxx-xxxx-xxxx-xxxx-xxxxxxxxxxxx/resourceGroups/TestRG/providers/Microsoft.Network/publicIPAddresses/PIPSQL2  
  data: Name : PIPSQL2  
  data: Type : publicIPAddresses  
  data: Location: westus  
  data: Tags : displayName=PublicIPAddresses - SQL  
  data:   
  data: Id : /subscriptions/xxxxxxxx-xxxx-xxxx-xxxx-xxxxxxxxxxxx/resourceGroups/TestRG/providers/Microsoft.Network/publicIPAddresses/PIPWEB1  
  data: Name : PIPWEB1  
  data: Type : publicIPAddresses  
  data: Location: westus  
  data: Tags : displayName=PublicIPAddresses - Web  
  data:   
  data: Id : /subscriptions/xxxxxxxx-xxxx-xxxx-xxxx-xxxxxxxxxxxx/resourceGroups/TestRG/providers/Microsoft.Network/publicIPAddresses/PIPWEB2  
  data: Name : PIPWEB2  
  data: Type : publicIPAddresses  
  data: Location: westus  
  data: Tags : displayName=PublicIPAddresses - Web  
  data:   
  data: Id : /subscriptions/xxxxxxxx-xxxx-xxxx-xxxx-xxxxxxxxxxxx/resourceGroups/TestRG/providers/Microsoft.Network/routeTables/UDR-BackEnd  
  data: Name : UDR-BackEnd  
  data: Type : routeTables  
  data: Location: westus  
  data: Tags : displayName=Route Table - Back End  
  data:   
  data: Id : /subscriptions/xxxxxxxx-xxxx-xxxx-xxxx-xxxxxxxxxxxx/resourceGroups/TestRG/providers/Microsoft.Network/routeTables/UDR-FrontEnd  
  data: Name : UDR-FrontEnd  
  data: Type : routeTables  
  data: Location: westus  
  data: Tags : displayName=UDR - FrontEnd  
  data:   
  data: Id : /subscriptions/xxxxxxxx-xxxx-xxxx-xxxx-xxxxxxxxxxxx/resourceGroups/TestRG/providers/Microsoft.Network/virtualNetworks/TestVNet  
  data: Name : TestVNet  
  data: Type : virtualNetworks  
  data: Location: westus  
  data: Tags : displayName=VNet  
  data:   
  data: Id : /subscriptions/xxxxxxxx-xxxx-xxxx-xxxx-xxxxxxxxxxxx/resourceGroups/TestRG/providers/Microsoft.Storage/storageAccounts/testvnetstorageprm  
  data: Name : testvnetstorageprm  
  data: Type : storageAccounts  
  data: Location: westus  
  data: Tags : displayName=Storage Account - Premium  
  data:   
  data: Id : /subscriptions/xxxxxxxx-xxxx-xxxx-xxxx-xxxxxxxxxxxx/resourceGroups/TestRG/providers/Microsoft.Storage/storageAccounts/testvnetstoragestd  
  data: Name : testvnetstoragestd  
  data: Type : storageAccounts  
  data: Location: westus  
  data: Tags : displayName=Storage Account - Simple  
  data:   
  data: Permissions:  
  data: Actions: \*  
  data: NotActions:   
  data:   
  info: group show command OK

[AZURE.TIP] If you do not see all the resources, run the **azure group deployment show** command to ensure the provisioning state of the deployment is *Succeded*.